IN THE APPLICATION

OF

Michael J. Hulin

FOR

Automated Apparatus and System for Cooking, Drying and Peeling Shellfish Products

FILED WITH

THE UNITED STATES PATENT AND TRADEMARK OFFICE

EXPRESS MAIL MAILING CERTIFICATE
Express Mail mailing label number: EV 353 877 760 US
Date of Deposit 17 February 2004
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" under 37 CFR 1.10 on the date indicated above and is addressed to "Mail Stop Patent Applications, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450"

Michael L. Kroll
Attorney for Applicant

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to shrimp processing and, more specifically, to a method and apparatus for boiling, drying, peeling and size grading shellfish products such as shrimp and crawfish while simultaneously utilizing the by-products to process broth and salt. The present invention includes a fully automated means for processing shrimp, broth, salt, food additives, animal feed and fertilizer and moving the product from the loading dock to a finished product storage area without the need of human contact with the product thereby greatly reducing the risk of contamination and the cost of labor.

The procedures currently being used for processing shrimp require having personnel and employees manually dump the product into a conk tank and transfer it from one processing system into the next thereby exposing the food product to sweat, saliva, respiratory germs and the like. Furthermore, airborne

contaminants also come in contact with the food product during processing, increasing the risk of causing sickness and disease to the consumer.

Furthermore, airborne contaminants also come in contact with the personnel during processing thereby increasing the risk of respiratory disease associated with the inhalation of sodium bisulphate and other harmful airborne contaminants.

The present invention seeks to alleviate these inherent dangers by eliminating the need for workers to come in contact with the product and providing a plurality of vacuums and cleaning systems to ensure a clean environment during processing. Automated conveyors serve to move the product from one system to the next from the loading dock to the storage tank. Each system involved in the processing is independent from the others and the conveyors are not attached thereby allowing a facility to upgrade current equipment to the completely automated system in steps.

Description of the Prior Art

There are other shellfish processing means known in the art. While these shrimp processors may be suitable for the purposes for which they were designed, they would not be as suitable for the purposes of the present invention, as hereinafter described.

SUMMARY OF THE PRESENT INVENTION

A primary object of the present invention is to provide a method and apparatus for processing shellfish that will add automation to the current process.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that greatly reduces heat within the work area.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the contamination of product during the current drying system due to condensation which accumulates on ceiling and then drops onto product.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the exposure to excessive perspiration from employees, which currently falls directly onto product while loading, raking (rotating) and unloading.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates air contamination within the work area due to shrimp dust and possible preservatives such as sodium bisulphate that fishermen apply to raw product and that become airborne during the process.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the hands-on labor of loading and unloading raw product into the boiling system.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the hands-on labor of loading and unloading boiled seafood into dryers.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the hands-on labor of loading and unloading of dried product into the peeling device.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the hands-on labor of rotating the product every thirty minutes during the drying process.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the contamination transfer of shrimp dust from previous batches of product to subsequent batches of product.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the over-drying of smaller product and the under-drying of larger product while offering a perfectly dried product based on size.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the hands-on labor of hand picking debris from the finished product up to 66% above the present means.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that adds an additional smaller size of product, which is normally lost in the peeling process, thereby increasing the yield.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the breaking of the tips of the tails of the product, thereby having a great impact on the yield increase.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that offers a cleaner product without damaging the finished product thereby removing the legs, heads and shells while leaving the tails intact.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that adds an easy means of sanitizing between batches of product whereas the prior art has no sanitizing means whatsoever.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates the hands-on labor of sweeping up peelings and shrimp dust for shipment by packing the peelings and dust in 50-gallon drums.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that offers a more cost-effective and energy-efficient process of drying by utilizing residual heat from the boilers and broth system to heat the dryers.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that will reduce the cost of the product on the consumer end thereby making it a more desirable product.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that eliminates human contact therewith, thereby reducing the risk of contamination and the cost of labor.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein crates of iced shrimp are placed on a conveyor belt on the loading dock and transported to a tilt-dumping cage at the end thereof into which they are dropped so that the shrimp and ice fall into a conk tank and the crate is subsequently tossed aside by a removal bar to make room for the following crate thereby negating the need of manually dumping the product into the conk tank.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish including a conk tank filled with water wherein jetted water is used to separate conk shells and other heavy items which become trapped in the bottom of the tank while the lighter items which respond to the agitated water are moved to the transport system.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the conk tank includes a conveyor system to transport the product to a primary seafood boiler.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the primary seafood boiler cooks the product at a predetermined temperature for a selected amount of time while jetted air serves to stir it during the boiling process.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the primary seafood boiler is supplied and replenished with brine or salt water (water with salt added) that is mixed in a brine mixing tank and stored in auxiliary boilers to maintain the fresh brine at a specific temperature until such time that it is to be introduced into the primary seafood boiler.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish including a spray drying system wherein brine is extracted from the primary seafood boiler and injected into a heated furnace or hopper as a fine mist where it is almost immediately dehydrated thereby creating a solid product to be used as a seafood flavored salt or additive.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the product is transferred from the primary seafood boiler via a seafood dryer conveyor system where it is spread out and stirred by a plurality of spreader bars and rakes as it is cooled by high speed fans to terminate the cooking process in a thorough, uniform manner.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the product is transferred to dryers from the primary seafood boiler by a conveyor system rather than manually as is the current method used in the industry.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the product is dried in stacked dryers and rotated periodically at a predetermined rate to ensure even drying.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the product is

dried in spiral dryers that move the product in a spiral rotation to the top of the dryer where it is dumped through a chute back to the bottom and reloaded as the process is repeated.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that will vacuum dried product from the traditional box dryers into the peeling device described in this process.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that is to vacuum dried product from the traditional tumbler peelers previously being used. Which is one step for upgrading the old method to this new system.

Yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the dryers may be piggybacked with the product being transferred from one dryer to the next.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the product is transferred from the dryers to a peeling device that will de-shell the product while keeping the tails intact.

Another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish wherein the peeling device includes a spinning blade that causes the cleaned product to ride along the sides of an inner compartment which is smooth and allow the unclean product which is heavier and bulky to remain on the screen area.

Still another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that is simple and easy to use.

Still yet another object of the present invention is to provide a fully automated method and apparatus for processing shrimp and crawfish that is inexpensive to manufacture and operate.

Additional objects of the present invention will appear as the description proceeds.

The foregoing and other objects and advantages will appear from the description to follow. In the description reference is made to the accompanying drawings, which forms a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. These embodiments will be described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that structural changes may be made without departing from the scope of the invention. In the accompanying drawings, like reference characters designate the same or similar parts throughout the several views.

The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is best defined by the appended claims.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

In order that the invention may be more fully understood, it will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a schematic diagram of the present invention;

FIGURE 2 is a diagrammatic view of the product from the loading dock to the primary seafood boiler;

FIGURE 3 is a block diagram of the boiler system;

FIGURE 4 is a block diagram of the heat exchange system;

FIGURE 5 is a block diagram of the present invention;

FIGURE 6 is a block diagram of the dryer and its related components;

FIGURE 7 is a front view of the peeling device and associated options;

FIGURE 8A - 8C is a block diagram showing the components and relationship for the seafood processing system;

FIGURE 9 is a block diagram of the brine broth processing system;

FIGURE 10A - 10B is a block diagram of the heat recovery system; and

FIGURE 11 is a block diagram for processing the seafood byproducts.

DESCRIPTION OF THE REFERENCED NUMERALS

Turning now descriptively to the drawings, in which similar reference characters denote similar elements throughout the several views, the figures illustrate the Apparatus and System for Cooking, Drying and Peeling Shellfish Products of the present invention. With regard to the reference numerals used, the following numbering is used throughout the various drawing figures.

10 Shellfish Processing System

12 refrigerated loading dock

14 conk tank

16 jetted water

18 product

20 conveyor of 14

21 boiler system

22 primary seafood boiler

24 brine

26 brine mixing tank

28 auxiliary tanks

30 dryer

32 air return system

34 broth processing system

36 peeler

38 product transfer system

40 broth

42 broth storage tank

44 broth packaging

46 raw product testing

48 packaging room

50 loading dock conveyor

52 crate

54 ice

56 dumping cage conveyor

58 dumping cage

60 paddle wheel

62 ice guard

64 hot air manifold

66 conduit

68 random test of raw product

70 foreign substance/chemical detection sensors

72 gross weight monitoring

74 salinity monitoring sensors

76 high speed fans

78 spreader bars

80 rakes

82 spray drying system

84 product tracking

86 rheostats

88 timers

90 aerated conveyor belt

92 seafood dryer conveyor

94 humidity/moisture sensors

96 conveyor sensors

98 timer of 50

100 sanitizing system

102 collection system

104 vacuum system

106 air flow controls

108 air contaminate sensors

110 video monitoring

112 hopper of 36

114 screen of 36

116 motor-power source of 36

118 tilting unit

120 stationary stand

121 legs of 120

122 loading device

124 unloading device

126 screen sweeper

128 blade

130 opening of 112

132 control panel of 118

134 jets of 124

135 conventional tumbler (peeling device)

136 enhanced peeling device

138 peeler hinged access port

139 conventional leading means

140 sensors

141 conventional dust collection system

142 conventional boiler with screen baskets

143 product lifting unit

144 conventional boiler with conveyor

146 conventional dryers

148 stacked conveyor dryer (manual load and unload)

150 enhanced stacked conveyor dryer

152 spiral conveyor dryer

154 enhanced spiral conveyor dryer

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The following discussion describes in detail one embodiment of the invention. This discussion should not be construed, however, as limiting the invention to those particular embodiments, practitioners skilled in the art will recognize numerous other embodiments as well. For definition of the complete scope of the invention, the reader is directed to appended claims.

FIGURE 1 is a schematic diagram of the present invention **10**. Raw product **18** is crated in ice and introduced to the present invention **10** at a refrigerated loading dock **12** where raw product testing **46** is randomly performed to check for contaminants prior to being transferred to a conk tank **14** that serves to separate heavier items such as conk shells that become trapped in the lower section thereof. Jetted water **16** is injected into the conk tank **14** to agitate the contents therein, thereby moving the product **18** to a conk tank conveyer **20** for transferal to a primary seafood boiler **22** filled with a brine **24** mix of salt and water that is prepared in brine mixing tanks **26** and stored in auxiliary boilers **28** to maintain the brine **24** at a specific temperature until ready for distribution to the primary seafood boiler **22**. Once the product **18** is fully

cooked, it is transferred to at least one dryer **30**, with all dryers **30** supplied with hot air by an air return system **32** that transfers residual heat from all related heat generating equipment such as the boilers **22,28**, the broth processing system **34** and the like. The product **18** is subsequently delivered to the peelers **36** for deshelling once adequately dried by means of a product transfer system **38** that initially vacuums the smaller product **18** from the dryers **30** and continues to separate the product **18** by size as the suction of the vacuum gradually increases, thereby enabling the transfer system **38** to lift increasingly larger product **18** to the peeler **36**. The transfer system **38** is filtered to remove harmful contaminates such as bisodium sulfate.

Used brine **24** is removed from the primary seafood boiler **22** and transported to a broth processing system **34** for the development of a seafood flavored broth **40** that is then stored in broth storage tanks **42** prior to broth packaging **44**.

FIGURE 2 is a diagrammatic view of the movement of the product **18** from the refrigerated loading dock **12** to the primary seafood boiler **22** of the present invention **10**. The product **18** is delivered to the loading dock conveyor **50** packed in crates **52** with ice **54** and transported to the inclined dumping cage

conveyor **56** and tumbles into the dumping cage **58** thereby allowing the ice **54** and product **18** to fall into the conk tank **14**. The dumping cage **58** then rejects the empty crate **52** and tosses it aside to allow the following crate **52** to drop therein. A plate-like vertical ice guard **62** traverses the width of the conk tank **14** and extends above and below the water surface to prevent the floating ice **54** from contacting the conk tank conveyor **20**. The product **18** travels along on the conk tank conveyor **20** and is then delivered into the primary seafood boiler **22** where it is cooked at a predetermined temperature for a specific amount of time. At least one agitation means, such as the paddle wheel **60** shown, is provided to stir the product **18** to allow for the uniform cooking thereof.

Figure 3 is a block diagram of the boiler system **21** demonstrating the fluid connections through conduit **66** from the brine mixing tank **26** to the auxiliary tanks **28** and the primary seafood boiler **22** and then to the broth processing system **34**.

Figure 4 is a block diagram depicting the heat exchange system of the present invention **10** wherein heat is scavenged from heat -generating machinery such as the auxiliary tanks **28**, the primary seafood boiler **22** and the broth

processing system **34** and transferred to the dryers **30** by means of a warm air manifold **64**. An air return system **32** returns the air from the dryers **30** and returns it to the heat generating machinery.

Figure 5 is a block diagram of the present invention **10** wherein the primary seafood boiler includes paddle wheels **60** and jetted water **16** to agitate the liquid and product **18** therein. Random product testing **68** is performed prior to introduction to the system and foreign substance/ chemical testing **70** is performed within the conk tank **14** to assure greater safety of the food product. Quality control in the cooking process includes a plurality of automated tests and overseer devices such as gross weight monitoring **72**, salinity monitoring sensors **74**, product tracking means **84**, timers **88**, rheostats **86** and the like. The shellfish product **18** is moved from the primary seafood boiler **22** via the primary seafood boiler conveyor **92** which has a mesh like belt to move the product **18** to the dryer **30** while letting air pass through. High speed fans **76** above the primary seafood conveyor **92** blow air over the food as it travels therealong to blow away the steam from the shellfish product **18** and cool it off to terminate the cooking process. A plurality of spreader bars **78** and rakes **80** serve to ensure that the seafood product **18** is evenly distributed over the

conveyor **92.** Heat is transferred from the primary seafood boiler **22** to the dryer **30** by a hot air manifold **64** and returned thereto for reheating by a hot air recovery & air circulation system **32**.

Figure 6 is a block diagram of the dryer **30** and its related components including conveyor sensors **96** for monitoring how much product **18** is being transferred from the boiler **22** to the dryer **30**. Thermostats and regulators **112** are provided for temperature control and humidity and moisture sensors **94** activate the conveyor rakes **80** to stir the product **18** during drying. Other such options to monitor and regulate the dryer **30** functions include video monitoring **110**, rheostats **86**, air contaminate sensors **108**, air flow controls **106**, and a timer **98** to determine product **18** rotation which activates conveyor causing product **18** to be dumped from the upper level of the chute to the lower level. Further options include a sanitizing system **100**, a collection system **102,** a built-in vacuum system **104**, and video monitoring **110.**

Figure 7 is a front view of the peeler **36** and additional options associated therewith. The stainless steel outer container **112** has an opening **130** at the top for manual unloading by dumping or vacuuming cleaned product **18**

therethrough. The opening **130** is also used for the auto-loading device **122**. The spinning blade **128** may be fabricated of a wide variety of materials including stainless steel, aluminum, polymeric composites etc. The motor and power source **116** may be electrical, pneumatic or hydraulic. The screen **114** is constructed of a plain weave, single or double square screen or meshed material. The unloading device is a sectional piece of the screen which opens and allows the screen sweeper **126** to sweep cleaned product into the opening **130** which jets air for extraction of product **18**. The hopper **112** may be mounted on a mobile tilting unit **118** with a control panel **132** for manual dumping or on a stationary stand **120** with legs **121** for use with air induced loading **122** and unloading **124** devices.

FIGURES 8A - 8C is a block diagram of the seafood processing system of the present invention comprised of delivery to the conk tank, cleaning the shrimp in a conk tank, boiling the shrimp, drying the shrimp and peeling the shrimp. Anyone of these function can accomplished in whole or in part by the system of the present invention. Delivery of the shrimp to the conk tank **14** can be either manual or automated. In the automated method the shrimp is placed on either a conveyor belt **50** or product lifting unit **143** that either may have a

dumping cage **58** forming an integral part therewith. The conk tank **14** is used to clean the seafood product and remove any foreign matter therefrom which may include sensor(s) for determining chemical contaminants. The conk tank **14** may also include apparatus to enhance processing of the seafood, such as water jets **16**, raw product testing **46** dumping cage **58**, paddle wheel **60**, ice guard **62**, random testing of product **68**, and salinity monitoring sensor(s) **74**. Once the seafood product is cleaned, it is moved either manually or mechanically to a boiler. The boiler may be a conventional boiler with lift baskets **142** or conveyor **144** or the boiler system **22** of the present invention. Each of these may incorporate additional apparatus, such as auxiliary tanks **28** and/or hot air manifold **64** providing additional functions. In addition, other processes may extend from the boiling of the seafood product, such as processing the brine solution into a broth 34 or food flavoring **82**. Once boiled the seafood product is moved either manually or mechanically to a drying process. The drying process may include conventional dryer box with screened deck **146**, spiral conveyor dryer **152**, **154** or stacked conveyor dryer **148**, **150** with each of these devices having additional apparatus, such as air return system **32**, spreader bars **78**, rakes **80**, product tracking **84**, aerated conveyor belt **90**, conveyor sensors **96**, sanitizing system **100**, collection system **102**, vacuum system **104**, air flow

control **106**, air contaminate sensors **108** and video monitoring **110** for enhancing the functionality of the drying system. Once dried the product is transferred either manually or mechanically to a peeling process. The peeling process may include conventional tumbler peeler **135**, peeler **136**, and peeler **36** where each of these may include additional apparatus, such as loading device **122**, screen sweeper **126**, blade **128**, tilting unit **118**, stationary stand **120**, unloading device **124**, hopper **112** and screen access panel **138**.

FIGURE 9 shows a block diagram of an additional element of the present invention comprising a brine broth processing system **34** wherein brine **24** from the brine mixing tank **26**, auxiliary tanks **28** or salt is added to water and introduced into the aforementioned boilers and under predetermined conditions the broth **40** is moved to storage tank(s) **42** where it is packaged **48** as either a brine broth **34** or spray dried **82** and packaged **48** as a food additive.

FIGURES 10A and 10B is a block diagram showing another element of the present invention comprising a heat recovery system. The system recovers heat from the aforementioned boiler systems and broth system and recycles the heat to the aforementioned boiler systems and/or dryer systems **148, 150, 152**

and **154** and/or peeling devices **36, 136.**

FIGURE 11 is a block diagram showing another element of the present invention comprising processing of the byproduct shells and heads of the seafood process. As previously stated the seafood passes from the conk tank **14** to the boiler system **21** to the dryer **30** and peeler **36.** The byproduct shells and heads are transferred to a product transfer system **38** and packaged for resale.

It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of methods differing from the type described above.

While certain novel features of this invention have been shown and described and are pointed out in the annexed claims, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.